

Calorimetric Determination of the Standard State Thermodynamic Properties for Aqueous Gadolinium Perrhenate and Gadolinium Chloride up to 623 K

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The solution of solid gadolinium oxide (cubic) in an excess of a non-complexing strong acid (perrhenic acid) solution was investigated by an integral heat method up to 623 K and at saturation pressure of water [1], from which the standard state partial molal thermodynamic properties for aqueous gadolinium perrhenate were determined. From the measured differences between standard state partial molal thermodynamic properties of aqueous chloride ion [1,2,3] and perrhenate ion [1,4,5] the standard state partial molal thermodynamic properties for aqueous gadolinium chloride [1,6] were obtained by ionic additivity, and corrected by a separate determination of the high temperature hydrolysis [1]. The enthalpy of solution of gadolinium chloride at 623 K and at saturation pressure of water obtained from this research (-2.8 MJ/mol) is apparently larger than any other recorded molar enthalpy of a chemical reaction involving aqueous systems.

[1] E. Djamali, Ph.D. Dissertation, University of California, San Diego and San Diego State University, (2005)

[2] C.M. Criss, and J.W. Cobble, J. Am. Chem. Soc., **83**, 3223 (1961)

[3] W.L. Gardner, R.E. Mitchell, and J.W. Cobble, J. Phys. Chem., **73**, 2025 (1969)

[4] J.C. Ahluwalia, and J.W. Cobble, J. Am. Chem. Soc., **86**, 5377 (1964)

[5] K. Chen, Ph.D Dissertation, University of California, San Diego and San Diego State University, (1987)

[6] E.C. Jekel, C.M. Criss, and J.W. Cobble, J. Am Chem. Soc, **86**, 5404 (1964)